



Vital Signs Monitoring Program



Knowing the condition of natural resources in national parks is fundamental to the National Park Service's ability to manage park resources "unimpaired for the enjoyment of future generations." The challenge of protecting and managing a park's natural resources requires a broad-based knowledge of the status and trends of park resources and takes an ecosystem approach. Most parks are open systems vulnerable to threats such as air and water pollution and invasive species, which originate outside of the park's boundaries. Understanding the dynamic nature of park ecosystems and the consequences of human activities is essential for management decision-making aimed to maintain, enhance, or restore the ecological integrity of park ecosystems and to avoid, minimize, or mitigate ecological threats to these systems.

Long-term vital signs monitoring helps determine changing conditions of natural resources in order to guide adaptive management decisions.



Water quality information can help identify pollution sources and ensure that wildlife and visitor safety needs are met.

The mission of the National Capital Region Network Monitoring Program is to monitor the status and trends of the region's ecosystem health and provide information that enables the parks to better manage and interpret their natural resources.



Monitoring white-tailed deer populations will help us understand their effects on forest regeneration.

Eleven Parks of the National Capital Region Network

- Antietam National Battlefield
- Catocin Mountain Park
- Chesapeake and Ohio Canal National Historical Park
- George Washington Memorial Parkway
- Harpers Ferry National Historical Park
- Manassas National Battlefield
- Monocacy National Battlefield
- National Capital Parks – East
- Prince William Forest Park
- Rock Creek Park
- Wolf Trap Farm Park

THE NATIONAL CAPITAL REGION NETWORK

The region's urbanizing landscape plays a significant role in each park's ecology. Many of the parks were established for their cultural and recreational value yet provide numerous ecological benefits including riparian buffers that reduce watershed pollution, contribute to air quality, and protect scenic vistas. The parks also provide some of the last remaining habitats for many rare plant and animal species or communities. Invasion of exotic plant species, relatively high deer abundance, rapidly developing surroundings, fragmented habitats, water and air pollution, and climate change, represent the region's most challenging management issues.



PROGRAM GOALS

- Determine status and trends in indicators of the condition of park ecosystems to help managers make better-informed decisions and work more effectively with other agencies and individuals to benefit park resources.
- Provide early warning of abnormal conditions and impairment of selected resources to help develop effective mitigation measures and reduce costs of management.
- Provide data to better understand the dynamic nature and condition of park ecosystems and to provide reference points for comparisons with other altered environments.
- Provide data to meet certain legal and congressional mandates related to natural resource protection and visitor enjoyment.
- Provide a means of measuring progress towards performance goals.

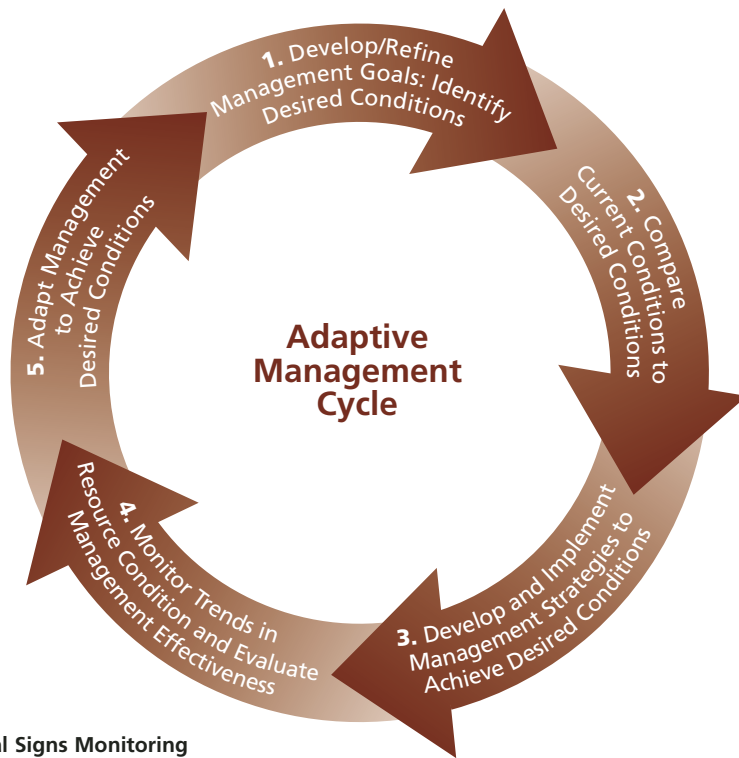
VITAL SIGNS

Vital signs provide information about the health of our park ecosystems. They are (1) select physical, chemical, and biological elements and processes of park ecosystems; (2) known or hypothesized effects of stressors; or (3) elements that have important human values. The vital signs selected for the National Capital Region Network (see table on facing page) are a subset of the total suite of natural resources that park managers are directed to preserve. In situations where natural areas have been so highly altered that physical and biological processes no longer operate (e.g., natural fire and flooding regimes), information obtained through monitoring can help managers understand how to implement the most effective approach to managing or restoring natural systems. Long-term vegetation data, for example, can support habitat restoration, trigger invasive plant eradication, or support deer management. Knowledge about the status of rare, threatened and endangered species will be critical for park planning efforts such as trail enhancements or other beautifications.

The parks in the National Capital Region are situated in the midst of a rapidly urbanizing landscape.

Vital Signs Monitored by the National Capital Region Network			
Category	Vital Sign Name	Vital Sign Measures	Possible Management Application
Air and Climate	Ozone*	Atmospheric ozone concentration	Minimize ozone exposure to visitors and staff.
	Wet deposition*	Wet deposition chemistry (pH, NO ₃ ⁻ , SO ₄ ⁻), NADP	Rigorous determination of air quality impacts to watersheds within and surrounding parks.
	Visibility and particulate matter*	Visibility (PM 2.5 mass fraction)	Minimize air pollution exposure to visitors and staff.
	Mercury deposition*	Mercury Deposition Network	Supports regional air quality monitoring and serves to augment local health advisories.
	Weather*	Ambient temperature, precipitation	Supports understanding of local climate change and land use impacts.
Geology and Soils	Shoreline features	Rate of shoreline change	Determine need for shoreline restoration.
	Physical Habitat Index (PHI)	Stream habitat structure, river depth, vegetation composition on adjacent lands	Identify stream restoration areas; identify threats to stream habitat.
Water	Surface water dynamics	Flow, discharge (CFS), gauge/stage height	Identify threats to maintaining stream flow and corresponding benchmarks for restoration efforts.
	Water chemistry	Core parameters (pH, DO, specific conductance, temp), acid neutralizing capacity	Characterize the range of chemical constituents and identify excesses or deficiencies to particular core water parameters.
	Nutrient dynamics	Nitrate, ammonia, total phosphate	Identify potential pollution sources.
	Aquatic macroinvertebrates	Species composition and abundance	Identify impacts of pollution and habitat loss to benthic communities.
Biological Integrity	Invasive/exotic plants	Detection of new species in sensitive areas	Identify where exotic plant eradication efforts are needed.
	Forest insect pests	Presence of new pest species	Control new infestations before they become a resource threat.
	Forest vegetation	Species diversity, age and size classes	Assess need for deer management; trigger invasive species or pest species management; evaluate effectiveness of exotic plant treatment.
	Fishes	Species composition	Identify pollution sources; trigger restoration efforts.
	Amphibians	Species composition and proportion of area occupied, malformations	Trigger wetland or upland management for significant amphibian habitats; identify pollution sources.
	Landbirds	Species composition and abundance	Recommend and evaluate forest and grassland management efforts; inform regional assessments of significant bird areas.
	White-tailed deer	Deer density	Assess deer management efforts; protect herd health and vegetation communities.
	T&E species and communities	Presence and absence, status, threats	Trigger site restoration; meet legal/policy requirements.
Landscapes (Ecosystem Pattern and Processes)	Land cover/land use	Area of dominant land cover types, connectivity, core/edge ratio of dominant forest communities, weighted average patch size, adjacency matrix	Evaluate ecosystem conversion; inform regional assessments of land use; derive importance of parks in urbanizing landscape.
	Landscape condition	Landuse intensity, disturbance status	Evaluate cumulative habitat change; trigger habitat restoration.

* Vital signs that are already monitored by partner agencies.



The Vital Signs Monitoring Program is an integral part of the adaptive management cycle by providing critical information.

IMPLEMENTATION

Detailed vital sign monitoring protocols will document step-by-step guidance for collecting, analyzing, and reporting information for each vital sign. Centralized staffing, agreements with cooperators, and park supported programs are some of the mechanisms that will be used for implementing monitoring efforts. In some cases other agencies are already monitoring vital signs (for example, air and climate) and the NPS monitoring program will focus on acquiring data, interpreting, and reporting results.

INTEGRATION WITH MANAGEMENT

As part of the Service's efforts to improve park management through greater reliance on scientific knowledge, a primary purpose of the monitoring program is to develop, organize, and make available natural resource data by transforming data into useful information through analysis, synthesis, modeling, and reporting. Vital signs monitoring will be an integral part of the adaptive management cycle by providing critical information about trends in natural resource conditions. The information will be available to identify desired conditions and evaluate management effectiveness.



To help deliver the information needed at the park, network, regional, and national levels, the vital signs networks are designing a system for scientific data collection, analysis, and reporting that is unprecedented in the National Park Service.

Through monitoring and adaptive management, the NPS can protect its natural environment.